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1 413 842

# PATENT SPECIFICATION

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(19)


## (54) A FLOATING VESSEL WITH REMOVABLE SECTIONS

(71) We, GERASIMOS NICOLAOU DRAGONAS, a Greek citizen, of Villa Sevigne, 15 Boulevard de Suisse, Monte Carlo, Monaco, and ANDREW GEORGE SPYROU, a British subject, of Residence Bois Joli C, Avenue de la Gare, Cap d'Ail 06, France, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement:—

This invention is concerned with improvements in and relating to vessels.

The size of cargo carrying vessels and in particular tankers, hereafter called 'crude carriers', has increased very considerably in recent years to vessels of the order of 250,000 to 350,000 tons.

Apart from structual considerations, one of the principal difficulties in enlarging the size of crude carriers to the region of 1,000,000 tons and over is the time consumed in cargo handling for a vessel of this size by use of conventional pumping methods. In addition, very large crude carriers, which will be referred to as VLCCs, of the proposed size are physically too large for the shipyards and docking facilities presently provided in most parts of the world.

According to the present invention there is provided a vessel comprising a buoyant skeleton part carrying propulsion and steering means and defining a plurality of recesses which are open upwardly, downwardly and laterally of the vessel, a plurality of buoyant container portions engageable in the recesses, and means for releasably engaging the container portions of the recesses, the container portions when engaged with the skeleton part defining therewith the exterior hull shape of the vessel.

Such a vessel may be used for various cargoes, such as solids, liquids and gases, but is particularly intended as a crude carrier.

The present invention will be more fully understood from the following description of an embodiment thereof, given by way of example only, reference being had to the accompanying drawings, in which:—

FIGURE 1 is a perspective view of the skeleton part of a vessel and a cargo container portion detached therefrom;

FIGURE 2 is a perspective view of a cargo container portion;

FIGURE 3 is a plan view of a part of the skeleton part and of a container portion;

FIGURE 4 is a perspective view of a vessel in process of attachment of a loaded cargo container portion;

FIGURE 5 is an enlarged perspective view of a part of the skeleton part and a part of a cargo container portion;

FIGURES 6 &7 are a plan and a partial vertical section through a cargo container portion showing the oil pumps and power units for their operation, and

FIGURE 8 is a plan view of two cargo container portions being towed by two tugs.

The vessel comprises a buoyant skeleton part 1 having a bow section 2, a spine 3, an intermediate or mid-ships section 4 and a stern section 5. This skeleton part houses the power unit, steering gear, main services, navigation gear, accomodation, ballast tanks, bunkers, etc.

The skeleton part defines a number of recesses or 'berths' 6 in each of which a buoyant cargo container portion 7 can be received. Means provided to engage the container portions 7 with the skeleton part 1 comprise lugs 8 on the skeleton part having tongues 9, the lugs being engageable in recesses 10 in the container portions and the tongues 9 engage in cavities 11 in the container portions upon relative vertical movement of each container portion 7 and the skeleton part 1.

In Figure 1 four berths 6 are shown in the skeleton part 1 but six or more may be provided.

The vessel of Figure 1 is envisaged as over 2,000 ft. in length and having four container portions of 250,000 tons capacity each. Where more than four container portions are envisaged, they are of lesser capacity to achieve a like total.

In operating the vessel, the container

[Price 33p]

portions are loaded by conventional means at the cargo loading point. For liquid cargoes their manifolds are connected by means of flexible pipes and couplings, or by connection to rigid metal flow booms.

The loaded container portions 7 are moved to the location of the skeleton part which generally does not enter the harbour or oil dock facility, by means of tugs, Figure 8 showing an example of two container portions 7 being moved by two tugs 12, to be further described. The container portions 7 are moved into the berths 6 in the skeleton part, the sequence being immaterial as the container portions are identical. The container portions being fully loaded, have a deep draught. When all container portions are provisionally in situ with the lugs 8 aligned with recesses 10, the skeleton part is ballasted. As it is lowered, the tongues 9 which have a wedge section, start to engage in the cavities 11 which are wedge-shaped as shown in Figure 5. The tongues 9 guide the container portions 7 through the ultimate stages of alignment in the berths 6 in the skeleton part 1. When the container portions 7 are in position with their decks flush with the deck of the skeleton part, they are positively locked thereto by locking means shown diagrammatically at 15, which are carried by the skeleton part on, for example, stems 16 which are hydraulicallly movable vertically. The locking means may have lugs engageable in recesses in the container portions and may provide locking in both directions of movement of a container portions 7 relative to the skeleton part 1. They can also include a facility to adjust the position of a container portions when one of its ends gets out of height alignment during the attachment process by providing a vertical thrust component on the container portion 7 relative to the skeleton part 1 or this component may be provided by power operated pads carried by the skeleton part and bearable on suitable surfaces of the container portions 7.

Instead of attaching all container portions simultaneously, as described above, one of several container portions 7 can be attached at a time. If the operation has to be done repeatedly, the skeleton part 1 is ballasted and de-ballasted repeatedly as required. If, for example, a single container portion at the bow end is to be attached, the skeleton part 1 may be ballasted down by the stern. The resulting misalignment in the horizontal plane is corrected in the attachment process by the wedge shaped tongues 9 and slots 11 which have a gradually increasing cone action which "levers" the container portion into position, and by the pad. The inevitable "bumps" against the hull of the skeleton part are taken up by a wooden or resilient surface layer 14 (Figure 5) on the skeleton part 1.

On completion of the loading operation, deck pipe lines on the container portions are coupled to those on the deck of the skeleton part, connecting all tanks to the ship's pumping system as in a conventional tanker. The ship can therefore be ballasted as required by transferring cargo from one tank to another

It is of course desirable for all container portions 7 to be attached simultaneously because this saves the maximum amount of time. Whether this can be done depends on the availability of the number of tugs required for simultaneous operation, on the tranquillity of the sea, and on the skill of the various operators.

Discharge of the cargo is effected in a like manner. The locking means 15 are released and the skeleton part 1 is de-ballasted until the container portions are free of the tongues 9 so that the container portions can be towed away. It is likewise possible to detach one or or several container portions, only, by anchoring the container portions which are not to be detached, to the skeleton part, with sufficient freedom to allow for the rise of the skeleton part during de-ballasting. These container portions thus remain semi-captive in such a position that they lock again automatically when the skeleton part is re-ballasted.

Container portions which are delivered for discharge are at once replaced by empty container portions, if there is insufficient time to discharge and return the container portions. Advantageously, sufficient numbers of container portions are provided for the necessary number of container portions to be ready at the discharging or loading place, to effect tthe exchange without waiting for the loading and/or discharging operation to be completed. As crude oil traffic on a large scale operates generally between one loading facility in the East and one or several refinery docks in Europe, appropriate arrangements can be made. In operation, loaded container portions are provided at one end and empty of the vessel's journey container portions at the other, so that the loading and discharge time does not cause standstill of the skeleton part. It is expected that this system will result in a faster turnaround of the vessel which will produce important operational economics.

Referring again to Figure 8, this shows a special method which could be used to propel two container portions by two tugs, employing special tackle in the form of bridles. In this configuration, container portions can be transported quite conveniently over long distances. The con-

figuration would be used primarily for the purpose of transporting container portions from one loading or discharge point to another, for operational purposes.

Positioning of the container portions in the last stage, that is after the tugs have pushed the container portion into approximate position inside the berth, is effected by ropes and winches. The skeleton part is provided with two deck winches (not shown) at every berth which serve to pull the container portions close to the skelcton part and to regulate its longitudinal position. If the operation is to be performed at the optimum level of efficiency (simultaneously for all caissons), close co-operation between all winch operators (who would also control the hydraulic pads) is required. To facilitate this process, computerized controls for the pads, winches and the ballasting pumps may be used and including sensing elements such as electric eye cells, which continously compare the deck levels of the skeleton part with those of each container portion, and proximity feelers which indicate whether both ends of each container portion are within tongue-engagement distance. At the appropriate moment, and after all adjustments at the winches have been performed under computer control, the skeleton part is lowered by ballasting. During this stage, it is the task of the winch operators (or of the computer) to take up the slack as the distance between the container portion decks and the skeleton part deck diminishes.

An elaborate computer is not required but a simple control system which will prevent the supervisor on the bridge lowering the ship until all winch operators report that all container portions are in correct pre-locking alignment.

It will be noted that the berths have tongues 9 on all three sides. The transversely positioned tongues 9 have the secondary purpose of transferring those stresses which are normally taken up by the hull of a ship, to the hull of the container portion.

The container system changes the basic construction of the ship radically from that of conventional tankers. At present, VLCCs are constructed as all ships have been in the past. Stresses are primarily carried by a multitude of girders (keelsons) in the bottom of the ship. Tankers have fewer interior frames and stringers than other types of ships because their interior is pre-eminently empty of all structures, except for the bulkheads which divide the tanks. In enlarging tankers from the established size of 75,000 to over 200,000 tons (the present VLCCs), the longitudinal stiffening of the structure became of paramount importance. During trial runs, this part of the structure is generally checked by strain gauges.

The skeleton part of the ship described herein has a comparatively narrow spine or centre section which could accommodate only a comparatively small number of conventional girders. On the other hand, the elongated and narrow centre section lends itself very well to the use of a substantial box girder with cross-braces which will have greater stability than the ordinary profiled girders. The stress calculations for this type of box girder are more akin to structural engineering than to naval architecture, and the indications are that this form of rectangular "backbone" will furnish the rigidity which is required for a vessel of the proposed length which may easily bridge a number of wave troughs and may be temporarily less supported on several points of the structure. A floating bridge girder may be used, the narrow edge of which forms the keel, supported by a rudimentary bow and stern section. The latter contains all machinery (as in conventional tankers), and the "backbone" accommodates all auxiliary ballast tanks, bunkers and slop tanks, and also processing facilities for the dirty ballast.

The skeleton part alone of the ship is designed to be seaworthy in the absence of one or several container portions but its performance is considerably impaired by increased drag. In closed configuration (with all the container portions in situ), the ship should perform as well as a conventional ship, although there will be small gaps between the container portions and the skeleton part. These gaps, which set up resistance, may be avoided or closed by overlapping plates or elastic seals.

It will be evident that the above described system can also be applied to ordinary cargo carriers and not only to tankers. In this application, containerization containers can themselves form the container portions of the ship.

Finally, the ship has certain advantages in avoiding pollution. One of the principal objections to increases in the present size of tankers is the enormous increase in contamination which would occur if the ship meets with an accident. In the present container type ship, this danger is reduced because those container portions which are not affected by the accident can be set loose and can be subsequently recaptured and towed away. In all probability, in a serious accident oil pollution would be restricted to the contents of one container portion.

Therefore, this ship, in case of collision, stranding or fire, does not present the hazard to the entire ship and/or cargo as does the conventional ship and therefore should reflect favourably on insurance premiums.

This ship allows quick turn around

because cargoes can be left at one port while the remaining cargo is taken to the next port of discharge. This is particularly important in the case of cryogenic cargoes.

This ship may reduce the port charges due to reduction in gross tonnage.

This ship can, if desired, eliminate the discharging of cargoes by the ship's crew. Instead shore crews can handle the discharging of cargoes.

This ship allows the drydocking and repairs of the hull to be done with the minimum of delay to the ship.

WHAT WE CLAIM IS:—

1. A vessel comprising a buoyant skeleton part carrying propulsion and steering means and defining a plurality of recesses which are open upwardly, downwardly and laterally of the vessel, a plurality of buoyant container portions engageable in the recesses, and means for releasably engaging the container portions in the recesses, the container portions when engaged with the skeleton part defining therewith the exterior hull shape of the vessel.

2. A vessel according to claim 1 wherein the skeleton part comprises a bow section and a stern section connected by a spine, the recesses being defined between the bow and stern sections and laterally of the spine.

3. A vessel according to either claim 1 or claim 2 wherein the releasable engaging means are interengagable by relative vertical movement between the skeleton part and the container portion.

4. A vessel according to claim 3 wherein the releasable engaging means comprise tongue means and cavity means on the skeleton part and each container portion.

5. A vessel according to claim 4 wherein the tongue and cavity means are wedge shaped-in the vertical direction to facilitate interengagement.

6. A vessel according to either claim 4 or claim 5 wherein each tongue means extends downwardly from a lug mounted on the skeleton part and each cavity means opens upwardly into a recess in a container portion in which the lug is positioned when the releasable engaging means are engaged.

7. A vessel according to any of the preceding claims wherein the skeleton part comprises an intermediate section extending laterally from the spine intermediate the bow and stern sections and defining therewith the recesses which are defined on three sides by the skeleton part the releasable engaging means being positioned to couple a container portion to the skeleton part on the three sides of the recess.

8. A vessel according to any of the preceding claims wherein the skeleton part is provided with means operable to control the buoyancy thereof.

9. A vessel according to claim 2 or any of claims 3 to 8 when dependent on claim 2 wherein the spine is formed by a box girder.

10. A vessel substantially as herein described with reference to the accompanying drawings.

A. A. THORNTON & CO.,
Northumberland House,
303-306 High Holborn,
London, W.C.1.

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1413842 COMPLETE SPECIFICATION

2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

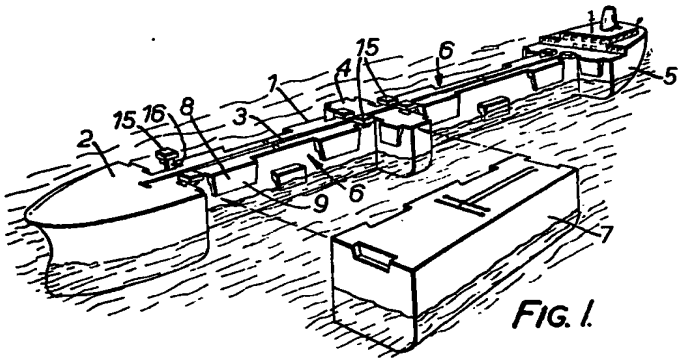


FIG. 1.

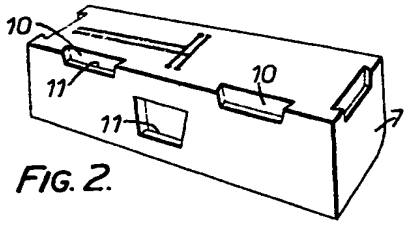


FIG. 2.

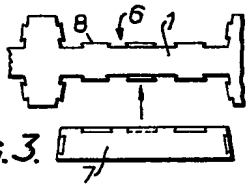





FIG. 3.

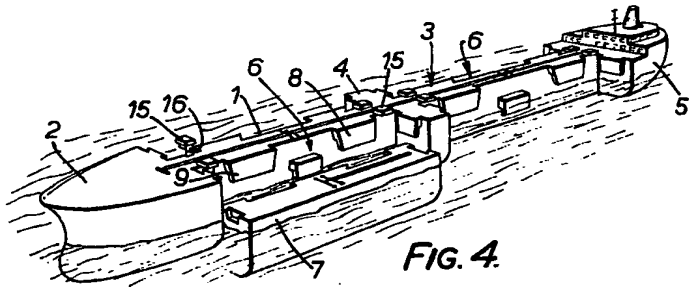


FIG. 4.

1413842 COMPLETE SPECIFICATION
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 2

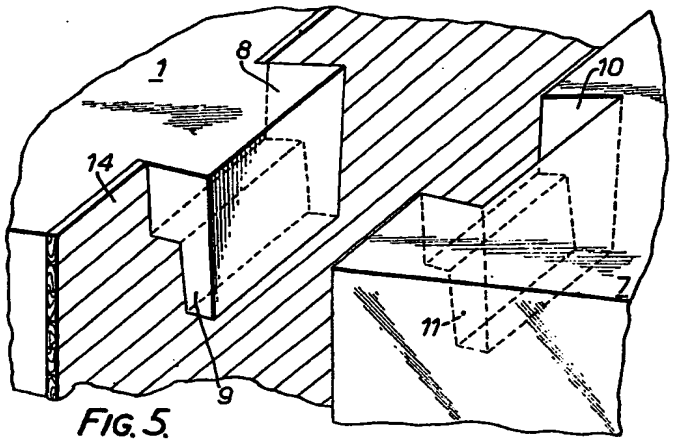


FIG. 5.

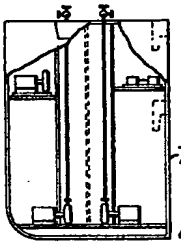


FIG. 6.

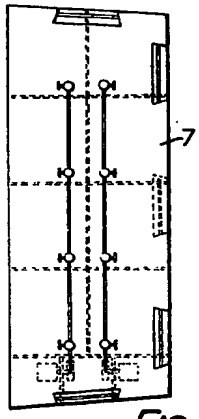


FIG. 7.

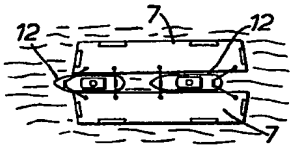


FIG. 8.